



# 2016 KING COUNTY SURFACE WATER DESIGN MANUAL AND COK ADDENDUM TRAINING

JANUARY 25<sup>TH</sup>, 2017

FEBRUARY 7<sup>TH</sup>, 2017

# OUTLINE

- INTRO – CONTEXT FOR CHANGES
- WHAT ARE THE CHANGES – COMPARISON OF 2009/2016 MANUALS
- 2017 PRE-APPROVED PLAN UPDATES
- EXAMPLES OF PROJECT IMPACTS
- QUESTION AND ANSWER

# NPDES STORMWATER PERMIT

TAKE ACTIONS TO REDUCE POLLUTION IN THESE AREAS:

1. PUBLIC EDUCATION
2. PUBLIC INVOLVEMENT
3. ILLICIT DISCHARGE DETECTION  
AND ELIMINATION
4. CONTROLLING STORMWATER RUNOFF  
FROM DEVELOPMENT/REDEVELOPMENT
5. POLLUTION PREVENTION AND  
GOOD HOUSEKEEPING FOR  
MUNICIPAL OPERATIONS



# LID ZONING CODE INTEGRATION

- NPDES PERMIT REQUIRED CITY TO REVIEW, REVISE AND IMPLEMENT CODES TO MAKE LID THE PREFERRED AND COMMONLY-USED APPROACH TO SITE DEVELOPMENT.
- IN DECEMBER 2016, KIRKLAND COUNCIL VOTED TO INCORPORATE LID IN THE FOLLOWING ZONING CODE CHAPTERS:
  - CHAPTER 95: TREE MANAGEMENT AND REQUIRED LANDSCAPING
  - CHAPTER 114: LOW IMPACT DEVELOPMENT
  - CHAPTER 115, SECTION 115.90: CALCULATING LOT COVERAGE



# EFFECTIVE DATE OF NEW MANUAL

- COUNCIL ADOPTED THE 2016 KING COUNTY SURFACE WATER DESIGN MANUAL ON OCTOBER 18<sup>TH</sup>, 2016
- EFFECTIVE JANUARY 1, 2017

# RESOURCES

- WHAT REFERENCES YOU NEED TO DESIGN STORMWATER IN KIRKLAND:
  - 2016 KING COUNTY SURFACE WATER DESIGN MANUAL
    - [HTTP://WWW.KINGCOUNTY.GOV/SERVICES/ENVIRONMENT/WATER-AND-LAND/STORMWATER/DOCUMENTS/SURFACE-WATER-DESIGN-MANUAL.ASPX](http://www.kingcounty.gov/services/environment/water-and-land/stormwater/documents/surface-water-design-manual.aspx)
  - 2017 PRE-APPROVED PLANS AND POLICIES
    - INCLUDES POLICY D-10: ADDENDUM TO THE 2016 KING COUNTY SURFACE WATER DESIGN MANUAL
    - [HTTP://WWW.KIRKLANDWA.GOV/DEPART/PUBLIC\\_WORKS/DEVELOPMENTSERVICES/PRE-APPROVED\\_PLANS.HTM](http://www.kirklandwa.gov/depart/public_works/developmentservices/pre-approved_plans.htm)

# OVERVIEW OF MANUAL CHANGES

- LOW IMPACT DEVELOPMENT (LID) SUCH AS BIORETENTION, INFILTRATION TRENCHES, AND PERMEABLE PAVEMENT ARE REQUIRED TO A MAXIMUM EXTENT FEASIBLE
- UPDATE FACILITY REQUIREMENTS NEAR STEEP SLOPES TO PROTECT PUBLIC FROM LANDSLIDE HAZARDS
- SINGLE FAMILY RESIDENTIAL – INCREASED REQUIREMENTS FOR PROJECTS GREATER THAN 2,000 SF OF NEW PLUS REPLACED IMPERVIOUS SURFACE (EX: MAJORITY OF PROJECTS WILL NOW TRIGGER A SOILS REPORT)

## CHANGE BY PROJECT SIZE

Project Size	Typical Project	Change with New Manual	Change to Project
<500 sf of new plus replaced impervious surface	Addition of patio or parking area to SFR	Surface Water Review required if near a sensitive area	Potentially medium change if near sensitive area
Small: 500 – 1,999 sf of new plus replaced impervious surface	Addition to a single-family house	Surface Water Review required if near a sensitive area	Potentially medium change if near sensitive area
Medium: 2,000 – 9,999 sf of new plus replaced impervious surface	2 – 4 lot short plat, small commercial projects	LID required to the maximum extent feasible, potential detention facility required	Potentially large change
Large: > 10,000 sf of new plus replaced impervious surface	Large commercial project, typically plats greater than 4	LID required to the maximum extent feasible	Potentially small change (facilities are already required)

The background is a light blue gradient. It features several white, 3D-style bubbles of various sizes. Some bubbles are partially cut off by the top and bottom edges of the frame. The bubbles are scattered across the top and bottom areas, with a few smaller ones in the middle.

# KING COUNTY MANUAL CHANGES

# DRAINAGE REVIEWS

- BASIC DRAINAGE REVIEW (USED TO BE SMALL TYPE I DRAINAGE REVIEW)
- SIMPLIFIED DRAINAGE REVIEW (USED TO BE SMALL TYPE II DRAINAGE REVIEW)
- TARGETED DRAINAGE REVIEW
- FULL DRAINAGE REVIEW

# DRAINAGE REVIEW – BASIC

- BASIC DRAINAGE REVIEW WILL REMAIN THE SAME
  - 500 SF – 1,999 SF OF NEW PLUS REPLACED IMPERVIOUS SURFACE ADDED
  - LID RECOMMENDED, NOT REQUIRED
  - ROUTE STORMWATER IN A MANNER THAT WILL NOT IMPACT NEIGHBORS



# DRAINAGE REVIEW - SIMPLIFIED

- SIMPLIFIED DRAINAGE REVIEW
  - ONLY FOR **SINGLE FAMILY RESIDENTIAL PROJECTS** (BOTH INFILL AND SHORT PLATS)
  - TRIGGERS...
    - GREATER THAN 2,000 SF OF NEW AND/OR REPLACED IMPERVIOUS SURFACE **OR** GREATER THAN 7,000 SF OF LAND DISTURBING ACTIVITY, AND
    - RESULTS IN LESS THAN 5,000 SF OF PGIS, AND
    - RESULTS IN LESS THAN  $\frac{3}{4}$  ACRE OF PGPS AND
    - IF IN PREDOMINANTLY TILL SOILS:
      - PROJECT RESULTS IN NO MORE THAN 7,947 SF OF TARGET IMPERVIOUS SURFACE AND PROPOSED PERVIOUS SURFACE AREA IS EQUAL TO OR LESS THAN  $14,941 - 1.88 \times (\text{TARGET IMPERVIOUS SURFACE})$
    - IF IN PREDOMINANTLY OUTWASH SOILS
      - PROJECT RESULTS IN NO MORE THAN 6,872 SF OF TARGET IMPERVIOUS SURFACE AND PROPOSED PERVIOUS SURFACE AREA IS EQUAL TO OR LESS THAN  $20,343 - 1.88 \times (\text{TARGET IMPERVIOUS SURFACE})$

# DRAINAGE REVIEW – SIMPLIFIED (CONT)

- WHAT IS A TARGET IMPERVIOUS SURFACE FOR THE CALCULATION:
  - NEW DEVELOPMENT (<35% IMPERVIOUS ON SITE)
    - NEW PLUS REPLACED IMPERVIOUS SURFACE
  - REDEVELOPMENT PROJECT (>35% IMPERVIOUS ON SITE)
    - IF PROJECT PROPOSES <5,000 SF OF NEW IMPERVIOUS **OR** THE VALUATION OF IMPROVEMENTS IS LESS THAN 50% OF THE ASSESSED VALUE
      - NEW IMPERVIOUS SURFACE ONLY
    - IF PROJECT PROPOSES >5,000 SF OF NEW IMPERVIOUS **AND** THE VALUATION OF IMPROVEMENTS IS GREATER THAN 50% OF THE ASSESSED VALUE
      - NEW PLUS REPLACED IMPERVIOUS SURFACE

# DRAINAGE REVIEW - TARGETED

- ANY PROJECT (DOES NOT MATTER THE SIZE OF THE PROJECT) CAN TRIGGER A TARGETED DRAINAGE REVIEW IF THE PROJECT:
  - 1) CONTAINS OR IS ADJACENT TO A FLOOD, EROSION, STEEP SLOPE HAZARD AREA, OR LANDSLIDE HAZARD AREA, OR
  - 2) PROPOSES TO CONSTRUCT OR MODIFY A DRAINAGE PIPE/DITCH THAT IS 12" OR LARGER OR RECEIVES RUNOFF FROM A 12" OR LARGER DRAINAGE PIPE / DITCH, OR
  - 3) REDEVELOPMENT PROJECTS PROPOSING >\$100,000 IN IMPROVEMENTS TO AN EXISTING HIGH USE SITE

# DRAINAGE REVIEW - FULL

- ANY NON-SINGLE FAMILY RESIDENTIAL PROJECT THAT CREATES MORE THAN 2,000 SF OF NEW AND/OR REPLACED IMPERVIOUS SURFACE OR GREATER THAN 7,000 SF OF LAND DISTURBING ACTIVITY TRIGGERS A FULL DRAINAGE REVIEW
- FOR SINGLE FAMILY RESIDENTIAL PROJECTS THAT DO NOT FALL UNDER SIMPLIFIED DRAINAGE REVIEW, THEY WILL BE A FULL DRAINAGE REVIEW

# DRAINAGE REVIEW – EXAMPLE

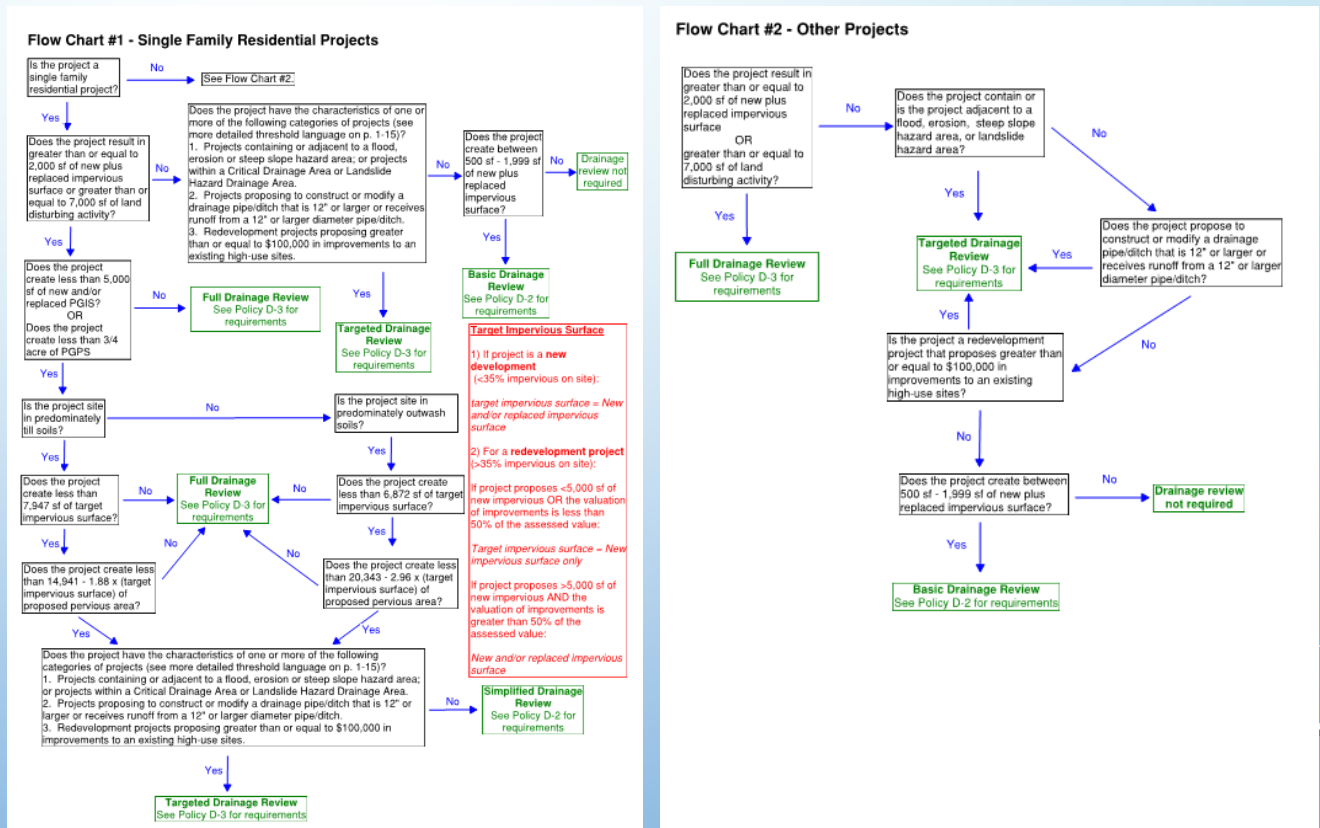
- SINGLE FAMILY RESIDENTIAL
- EXISTING IMPERVIOUS = 24%
- NO SENSITIVE AREAS
- LOT SIZE = 15,000 SF
- PROPOSED NEW PLUS REPLACED IMPERVIOUS SURFACE = 7,500
- PROPOSED NEW PERVIOUS SURFACE = 7,500
- TILL SOILS

# DRAINAGE REVIEW – EXAMPLE

- 7,500 SF OF NEW PLUS REPLACED IMPERVIOUS SURFACE
- 7,500 SF OF NEW PERVIOUS SURFACE
  - GREATER THAN 2,000 SF OF NEW AND/OR REPLACED IMPERVIOUS SURFACE **OR** GREATER THAN 7,000 SF OF LAND DISTURBING ACTIVITY, AND
  - RESULTS IN LESS THAN 5,000 SF OF PGIS, AND
  - RESULTS IN LESS THAN  $\frac{3}{4}$  ACRE OF PGPS AND
  - PROJECT RESULTS IN NO MORE THAN 7,947 SF OF NEW PLUS REPLACED IMPERVIOUS SURFACE
    - THIS PROJECT HAS 7,500 SF, SO YES, NO MORE
  - PROPOSED PERVIOUS SURFACE AREA IS EQUAL TO OR LESS THAN  $14,941 - 1.88 \times$  (TARGET IMPERVIOUS SURFACE)
    - $14,941 - 1.88 (7500) = 841$  SF
    - 7,500 SF OF PROPOSED PERVIOUS AREA < 841 SF? NO... THEREFORE IS A FULL DRAINAGE REVIEW

# DRAINAGE REVIEW FLOW CHART

- WE HAVE A FLOW CHART AND WE'RE WORKING ON A EXCEL SPREADSHEET CALCULATOR.
- LOOK AT FIGURE 1.1.2.A IN KCSDM – NOTE BASIC EXEMPTION: <5,000 SF NEW OR REPLACED IMPERVIOUS





The background of the slide features a light blue to white gradient. It is decorated with several stylized, 3D-rendered bubbles of various sizes. Some bubbles are located near the top edge, while others are clustered in the bottom right corner. The bubbles have a translucent blue appearance with white highlights and thin black outlines, giving them a realistic, floating look.

**QUESTIONS?**

# DEFINITION CHANGES

- REPLACED IMPERVIOUS SURFACE – NOT TO BARE SOIL ANYMORE, IT'S DOWN TO FOUNDATION.
- UNDERDRAIN – IF THERE IS AN UNDERDRAIN, THE SURFACE IS CONSIDERED 100% IMPERVIOUS. THIS APPLIES TO ANY SURFACE WITH AN UNDERDRAIN, INCLUDING BUT NOT LIMITED TO PERMEABLE PAVEMENT, ARTIFICIAL / SYNTHETIC TURF, OR LAWN.

# CORE REQUIREMENTS

#1 – DISCHARGE AT A NATURAL  
LOCATION

**#2 – OFFSITE ANALYSIS**

**#3 – FLOW CONTROL FACILITIES**

#4 – CONVEYANCE SYSTEM

**#5 - CSWPP**

#6 – O&M

#7 – FINANCIAL GUARANTEES AND  
LIABILITY

**#8 – WATER QUALITY FACILITIES**

**#9 – FLOW CONTROL BMPS (NEW)**

## #2 - OFFSITE ANALYSIS

- ADDED POTENTIAL IMPACTS TO WETLANDS HYDROLOGY
  - PROJECTS IN FULL DRAINAGE REVIEW WITH WETLANDS ON THEIR PROPERTY **OR** DOWNSTREAM OF THEIR PROJECT AND ARE NOT EXEMPT FROM FLOW CONTROL WILL NEED TO EVALUATE IMPACTS THROUGH A WETLAND HYDROLOGY STUDY
  - ADDITIONAL FLOW CONTROL OR OTHER MEASURES TO MITIGATE THE IMPACTS MAY BE REQUIRED
  - SEE POLICY D-13 OF PRE-APPROVED PLANS FOR ADDITIONAL GUIDANCE ON THIS REQUIREMENT

## #3 – FLOW CONTROL FACILITIES

- KCRTS IS NO LONGER AN APPROVED MODEL
- MGS FLOOD OR WWHM 2012 ONLY
- 15 MINUTE TIME STEP MUST BE USED FOR FLOW CONTROL SIZING
  - APPROXIMATELY 10-12% INCREASE IN DETENTION SIZE
- EXCEPTION TO FLOW CONTROL BASED ON 100-YEAR FLOW COMPARISON MUST BE RUN AT A 15 MINUTE TIME STEP AND THE DIFFERENCE MUST BE LESS THAN 0.15 CFS DURING THE 100-YEAR STORM EVENT
  - HARDER TO MEET EXCEPTION WITH 15 MIN TIME STEP AND NEW CREDITS

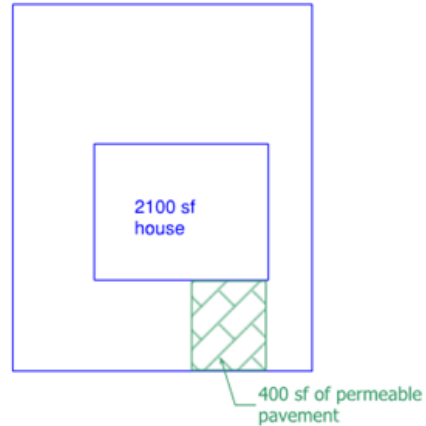
## #3 – FLOW CONTROL FACILITIES LOT COVERAGE CREDIT

- PROJECTS USING PERMEABLE PAVEMENT TO MEET A STORMWATER REQUIREMENT (REDUCE THE SIZE OF THE DETENTION SYSTEM OR TO MEET AN EXCEPTION TO NOT HAVE TO DO FLOW CONTROL), THE PROJECT WILL BE RESTRICTED TO THE LOT COVERAGE USED IN THE LSM PERMIT

# #3 – FLOW CONTROL FACILITIES LOT COVERAGE CREDIT - EXAMPLE

PROJECT WILL BE  
HELD TO LOT  
COVERAGE  
ASSUMED IN LSM  
PERMIT

(LSM) 4 lot short plat with  
5,000 sf lots



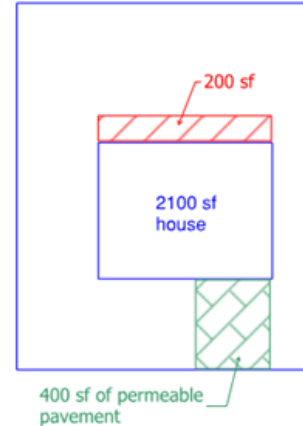
## Surface Water Calculations

2,100 sf - house  
200 sf - driveway (50/50)  
2,300 sf - impervious

$$2,300 \times 4 = 9,200 \text{ sf}$$

Use 9,200 sf to size detention system

(BSF) 4 lot short plat with  
5,000 sf lots



## Planning Calculations

2,300 sf - house  
200 sf - driveway (50/50)  
2,500 sf - impervious (50% lot coverage)

$$2,500 \times 4 = 10,000 \text{ sf}$$

Detention system undersized by 800 sf

NEED TO BE THE SAME



## #5 - CSWPP

- INCLUDES A MORE IN DEPTH EROSION PLAN (13 ESC MEASURES) AND NOW INCLUDES STORMWATER POLLUTION PREVENTION AND SPILL CONTROL (SWPPS) MEASURES
- REFER TO POLICY D-12 IN THE PRE-APPROVED PLANS FOR ADDITIONAL GUIDANCE
- WORKING ON A TEMPLATE TO HELP WITH EXPECTATIONS OF WHAT SHOULD BE REQUIRED FOR THIS COMPREHENSIVE PLAN

## #8 - WATER QUALITY FACILITIES

- ENHANCED TREATMENT NOW REQUIRES 30% REMOVAL OF DISSOLVED COPPER AND >60% REMOVAL OF DISSOLVED ZINC
  - FACILITIES THAT MEET ENHANCED TREATMENT REMAINED THE SAME
- NO CHANGE TO 5,000SF THRESHOLD TO TRIGGER WATER QUALITY
- ENHANCED TREATMENT REQUIRED FOR MULTI-FAMILY AND COMMERCIAL PROJECTS, EVEN IF PROJECT IS LESS THAN 1 ACRE IN SIZE
- ENHANCED TREATMENT REQUIRED FOR SINGLE FAMILY RESIDENTIAL IF ZONING IS 8 DWELLING UNITS PER ACRE OR MORE

## #8 - WATER QUALITY FACILITIES

- PERMEABLE PAVEMENT REQUIREMENTS FOR WATER QUALITY HAVE CHANGED
  - IF USING PERMEABLE PAVEMENT ON A POLLUTION GENERATING SURFACE, SOIL BENEATH THE PERMEABLE PAVEMENT MUST MEET THE SOIL SUITABILITY CRITERIA (SEE SECTION 5.2.1)
  - IF THE SURFACE IS A RESIDENTIAL DRIVEWAY SERVING 2 HOUSEHOLDS OR LESS, A 6" SAND LINER MAY BE INSTALLED IN LIEU OF CONDUCTING THE TESTING FOR THE SOIL SUITABILITY CRITERIA
  - IF NEITHER OF THE CRITERIA ABOVE CAN BE MET, PERMEABLE PAVEMENT IS INFEASIBLE FOR THE SITE (AND CANNOT BE ALLOWED AS A LOT COVERAGE CREDIT)

## ***NEW* #9 – FLOW CONTROL BMPS**

- >2,000 SF NEW / REPLACED IMPERVIOUS OR >7,000 SF LAND DISTURBING ACTIVITY
- LID PERFORMANCE STANDARD OR LIST APPROACH (MAX EXTENT FEASIBLE)
  - LID PERFORMANCE STANDARD
    - MATCH DURATION CURVE FROM 8% OF THE 2 YEAR TO 50% OF THE 2 YEAR
  - LIST APPROACH
    1. EVALUATE FULL DISPERSION
    2. EVALUATE FULL INFILTRATION FOR ROOF TOPS
    3. EVALUATE FULL INFILTRATION, LIMITED INFILTRATION, BIORETENTION OR PERMEABLE PAVEMENT TO THE MAXIMUM EXTENT FEASIBLE FOR ALL SURFACES NOT MITIGATED BY 1 AND 2
    4. EVALUATE BASIC DISPERSION

## ***NEW* #9 – FLOW CONTROL BMPS**

- SOILS REPORT REQUIRED IF PROJECT CAN'T FULLY DISPERSE
- POLICY D-8 IN PRE-APPROVED PLANS PROVIDES ADDITIONAL GUIDANCE FOR SOILS REPORT EXPECTATIONS TO MEET FLOW CONTROL BMP REQUIREMENTS

# NEW #9 – FLOW CONTROL BMPS

- CREDITS FOR IMPLEMENTING FLOW CONTROL BMPS ARE REDUCED, AND SIZING CHANGED FOR DIFFERENT SCS CLASSIFICATIONS

TABLE 1.2.9.A FLOW CONTROL BMP FACILITY SIZING CREDITS <sup>(1)</sup>	
Flow Control BMP Type	Facility Sizing Credit
Full dispersion	Model fully dispersed surface as forest <sup>(2)</sup>
Full infiltration <sup>(3)</sup>	Subtract impervious area that is fully infiltrated
Limited infiltration	Model tributary impervious surface as 90% impervious, 10% grass
Basic dispersion	Model dispersed impervious surface as 90% impervious, 10% grass
Farmland dispersion	Dispersed areas are considered non-targeted for flow control. Dispersed areas on sites with farm management plans are considered non-targeted for water quality treatment
Bioretention	Model tributary impervious surface as 90% impervious, 10% grass
Permeable pavement (unlined with no underdrain)	Model permeable pavement area as 50% impervious, 50% grass
Grassed modular grid pavement	Model modular grid pavement as all grass
Rainwater harvesting	Credit only allowed via and as specified in an approved drainage adjustment that details conditions of use.
Restricted footprint	Model footprint as restricted
Wheel strip driveways	Model credited area as 50% impervious, 50% grass
Minimum disturbance foundation	Model foundation area as 50% impervious, 50% grass
Open grid decking over pervious area	Model deck area as 50% impervious, 50% grass
Native growth retention credit	Model mitigated impervious area as 50% impervious, 50% grass
Perforated pipe connection	None

## ***NEW* #9 – FLOW CONTROL BMPS**

- KIRKLAND DEFAULT SIZING IS NO LONGER ACCEPTABLE
  - OVERFLOW CONNECTION STILL REQUIRED IF AVAILABLE, BUT FLOW CONTROL BMPS MUST BE SIZED PER SOIL INFORMATION



The background of the slide features a light blue gradient that transitions from a pale blue at the top to a deeper blue at the bottom. Scattered throughout this gradient are numerous bubbles of varying sizes. Each bubble is rendered with a thin, dark blue outline and a white highlight on its upper-left edge, giving them a three-dimensional, glossy appearance. The bubbles are more densely clustered in the upper-left and lower-right corners, with a few smaller ones floating in the center.

**QUESTIONS?**

# DRAINAGE POLICIES THAT ARE CHANGING

- POLICY D-2 AND D-3 (DRAINAGE REVIEW REQUIREMENTS)
- POLICY D-7: PRIVATE MAINTENANCE AGREEMENT (REMOVAL OF OCD-93)
- **POLICY D-8: SOILS REPORT REQUIREMENTS**
- **POLICY D-10: 2016 KIRKLAND ADDENDUM**
- POLICY D-11: ADJUSTMENT TO THE KCSWDM (SHOULD BE USING THIS MORE OFTEN FOR DEVIATIONS)
- POLICY D-12: CHANGES TO SWPPP REQUIREMENTS
- **POLICY D-13 (NEW): OFFSITE ANALYSIS WETLAND GUIDANCE**
- **POLICY D-14 (NEW): SPECIAL STORMWATER REQUIREMENT**
- **POLICY D-15 (NEW): NATIVE GROWTH RETENTION CREDIT (NGRC) ADDITIONAL REQUIREMENTS**

# POLICY D-8: SOIL INFORMATION TO MEET FLOW CONTROL BMPS

- EXPLAINS WHAT'S REQUIRED FOR A SOILS REPORT TO MEET FLOW CONTROL BMP REQUIREMENTS
  - MUST CLASSIFY SOILS PER SCS CLASSIFICATION (APPENDIX C SIZING IS BASED OF THIS)
  - GRAIN SIZE ANALYSIS IS REQUIRED
  - 1 SOIL LOG PER EACH PROPOSED INFILTRATION LOCATION (AT DISCRETION OF PUBLIC WORKS)
    - MINIMUM OF 4 FEET BELOW EXPECTED FINISH GRADE AND AT LEAST 1 FOOT BELOW EXPECTED BOTTOM ELEVATION OF FLOW CONTROL FACILITY
  - INFILTRATION RATE TESTING IS REQUIRED FOR PROJECTS THAT DO NOT HAVE AN OVERFLOW AND DO NOT HAVE A SCS CLASSIFICATION OF MEDIUM SAND OR BETTER

## POLICY D-10: COK ADDENDUM DEFINITION ADDITION

- OVERFLOW - A PIPE SHALL BE CONSIDERED AN OVERFLOW IF SUFFICIENT STORAGE IS PROVIDED BELOW THE INVERT OF THE PIPE TO MEET FLOW CONTROL BMP REQUIREMENTS. IN THESE SITUATIONS, THE FLOW CONTROL BMP WILL BE ALLOWED THE CREDIT ASSOCIATED WITH THE BMP. PER THE NEW IMPERVIOUS SURFACE DEFINITION IN THE 2016 KCSWDM, IF THE PIPE IS USED AS AN UNDERDRAIN, THE AREA WILL BE COUNTED AS NEW OR REPLACED IMPERVIOUS SURFACE AREA.

# POLICY D-10: COK ADDENDUM

## OTHER LARGER CHANGES

- FLOW CONTROL – 15 MINUTE TIME STEP IS REQUIRED IN THE CITY OF KIRKLAND. NO LONGER ACCEPT 1 HOUR TIME STEP
- FLOW CONTROL BMP IMPLEMENTATION – IN ROW, BMPS MUST BE EVALUATED IN THE FOLLOWING ORDER:

### **SIDEWALKS:**

1. BIORETENTION
2. PERVIOUS CONCRETE
3. LIMITED INFILTRATION

### **ROAD WIDENING:**

1. BIORETENTION
2. PERVIOUS CONCRETE PARKING STRIP (IF APPLICABLE)
3. LIMITED INFILTRATION
4. POROUS ASPHALT

- FLOW CONTROL BMP IMPLEMENTATION – DO NOT NEED TO DO REDUCED IMPERVIOUS SURFACE CREDIT OR NATIVE GROWTH RETENTION IF THE LIST APPROACH IS NOT FEASIBLE.
- EPA FALLING HEAD TEST IS AN ALLOWABLE INFILTRATION TESTING METHOD FOR BOTH FLOW CONTROL BMPS AND FLOW CONTROL FACILITIES (POLICY D-8 AND PLAN CK-D.22D)

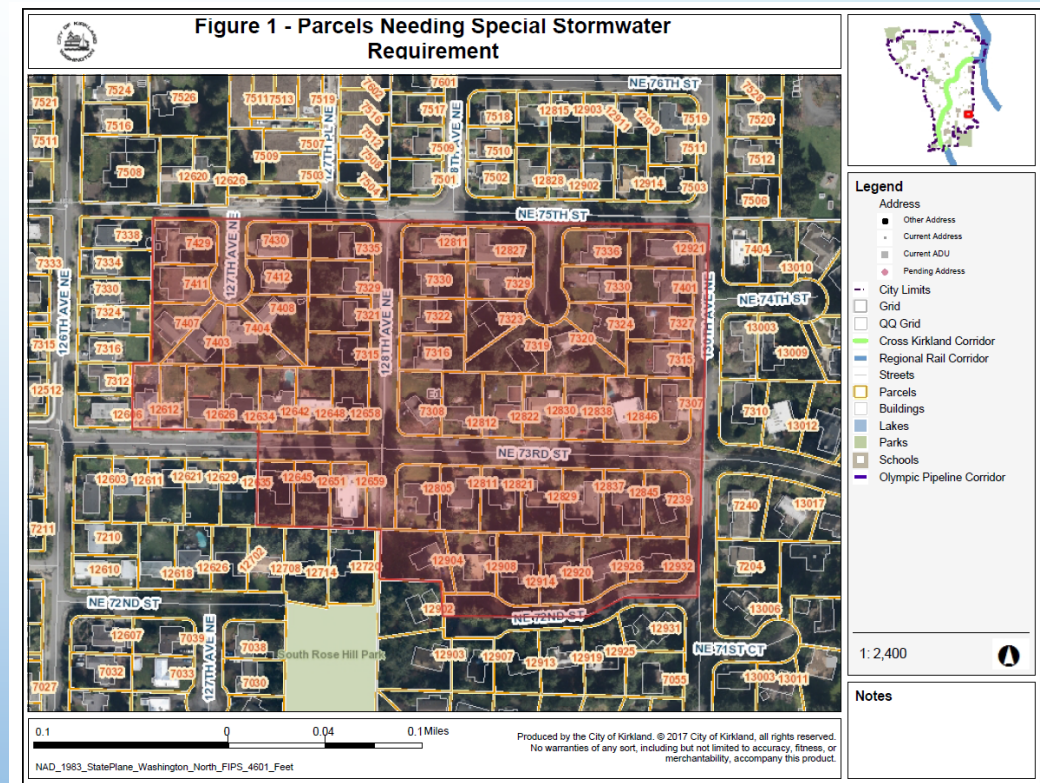
## POLICY D-13: WETLAND HYDROLOGY STUDY

- PROVIDE GUIDANCE ON REQUIREMENTS REGARDING OFFSITE ANALYSIS, SPECIFICALLY RELATED TO POTENTIAL IMPACTS TO WETLAND HYDROLOGY
  - IF WETLAND ONSITE
    - ONSITE WETLAND HYDROLOGY STUDY IS REQUIRED
  - IF WETLAND OFFSITE
    - IDENTIFIED  $\frac{1}{4}$  MILE DOWNSTREAM AND NOT EXEMPT FROM FLOW CONTROL
    - PUBLIC WORKS WILL DETERMINE THE NEED ON A CASE BY CASE BASIS



# POLICY D-14: SPECIAL STORMWATER REQUIREMENT

- DUE TO DOWNSTREAM CONSTRAINTS, PROJECTS LOCATED WITHIN FIGURE 1 MUST INFILTRATE 100-YEAR STORM EVENT FOR AREAS THAT DO NOT HAVE A DIRECT CONNECTION TO THE CITY'S STORMWATER SYSTEM (IN ADDITION TO MEETING 2016 KCSWDM)



## POLICY D-15: NGRC ADDITIONAL REQUIREMENT

- CAN USE NATIVE GROWTH RETENTION CREDIT AS A BMP OPTION TO MEET THE 0.15 CFS FLOW CONTROL EXCEPTION FOR CORE REQUIREMENT #3 (EVEN THOUGH NOT REQUIRED IN LIST APPROACH FOR CORE REQUIREMENT #9)
- ADDITIONAL REQUIREMENTS INCLUDE:
  - MINIMUM ALLOWABLE AREA = 10% OF LOT, AND SHALL NOT BE LESS THAN 500 SF
  - CONTIGUOUS ON LOT
  - AREA CAN NOT BE OVER A NGPE
  - MINIMUM WIDTH = 12 FEET
  - DEVELOPER TO INSPECT AND MAINTAIN FOR FIRST 3 YEARS



The background of the slide features a light blue gradient that transitions from a pale blue at the top to a deeper blue at the bottom. Scattered across this gradient are numerous bubbles of varying sizes. Each bubble is rendered with a thin, dark blue outline and a white highlight on its upper-left edge, giving them a three-dimensional, glossy appearance. The bubbles are concentrated more towards the top and bottom edges of the slide, with a few smaller ones in the center.

# EXAMPLES

# PROJECT EXAMPLE #1: 2 LOT SHORT PLAT

- OVERVIEW: SINGLE LOT  
SUBDIVIDING INTO 2 LOTS.

TOTAL PROJECT SIZE = 18730 SF

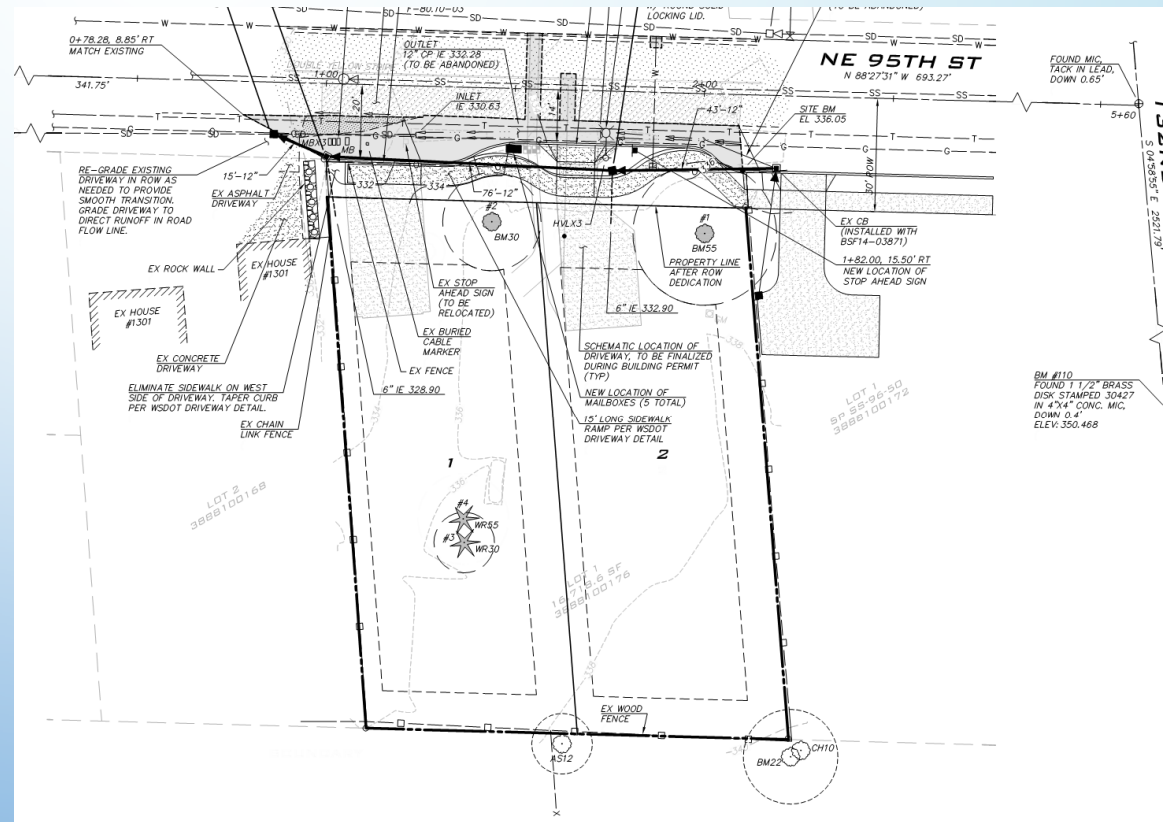
## EXISTING CONDITIONS:

EXISTING IMPERVIOUS = 4200 SF

## DEVELOPED CONDITIONS:

NEW & REPLACED = 8509 SF

NEW PERVIOUS = 10221 SF



# PROJECT EXAMPLE #1: 2 LOT SHORT PLAT

- DETERMINE DRAINAGE REVIEW LEVEL:
  - TOTAL PROJECT = 18,730 SF
  - EXISTING IMPERVIOUS = 4,200 SF
  - 22% IMPERVIOUS ON SITE, THEREFORE NEW DEVELOPMENT (CONSIDER ALL NEW AND / OR REPLACED IMPERVIOUS SURFACE
  - PROPOSED IMPERVIOUS = 8,509 SF
  - PROPOSED PERVIOUS = 10,221 SF
  - PROJECT IS IN TILL SOILS

# PROJECT EXAMPLE #1: DRAINAGE REVIEW

- START WITH SIMPLIFIED:
- 8,509 SF NEW AND REPLACED IMPERVIOUS SURFACE
- 10,221 SF NEW PERVIOUS SURFACE
  - GREATER THAN 2,000 SF OF NEW AND/OR REPLACED IMPERVIOUS SURFACE **OR** GREATER THAN 7,000 SF OF LAND DISTURBING ACTIVITY, AND
  - RESULTS IN LESS THAN 5,000 SF OF PGIS, AND
  - RESULTS IN LESS THAN  $\frac{3}{4}$  ACRE OF PGPS AND
  - PROJECT RESULTS IN NO MORE THAN 7,947 SF OF TARGET IMPERVIOUS SURFACE
    - 8,509 SF > 7,947 SF, THEREFORE DOES NOT MEET SIMPLIFIED
- **FULL DRAINAGE REVIEW**

# PROJECT EXAMPLE #1: 2 LOT SHORT PLAT

- FULL DRAINAGE REVIEW - REQUIRED TO EVALUATE ALL CORE REQUIREMENTS AND SPECIAL REQUIREMENTS
  - **CR#3 – FLOW CONTROL**: DOES NOT MEET THE 0.15 CFS EXCEPTION, EVEN WITH USING CREDITS FROM CR#9. THEREFORE, FLOW CONTROL REQUIRED (~5,000 CF VOLUME NEEDED, WITH CREDITS)
  - **CR#8 – WATER QUALITY**: NOT REQUIRED, <5,000 SF PGIS
  - **CR#9 – FLOW CONTROL BMPS**: USE BIORETENTION FOR SIDEWALKS, PERVIOUS PAVEMENT FOR DRIVEWAYS, EITHER INFILTRATION TRENCHES (~120 LF) OR BIORETENTION (~160 SF) FOR ROOFS

# PROJECT EXAMPLE #1: 2 LOT SHORT PLAT

## BEFORE TAKING CREDITS

Flow Frequency		
Flow(cfs)	Predeveloped	Mitigated
2 Year =	0.0126	0.0903
5 Year =	0.0199	0.1215
10 Year =	0.0239	0.1438
25 Year =	0.0283	0.1738
50 Year =	0.0310	0.1975
100 Year =	0.0332	0.2225

100 YR DIFFERENCE = 0.189 CFS

## WITH CREDITS

Flow Frequency		
Flow(cfs)	Predeveloped	Mitigated
2 Year =	0.0126	0.0818
5 Year =	0.0199	0.1121
10 Year =	0.0239	0.1341
25 Year =	0.0283	0.1640
50 Year =	0.0310	0.1879
100 Year =	0.0332	0.2132

ASSUME 1000 SF PERVIOUS PAVEMENT AND  
THE REST TO A 90/10 CREDIT

100 YR DIFFERENCE = 0.180 CFS

# EXAMPLE PROJECT – TEAR DOWN / REBUILD

Existing Conditions



Lot – 9600 sf  
Ex Imp – 2280 sf  
23.75% Lot Coverage  
New Imp – 600 sf  
Replaced Imp – 1900 sf  
Total Proposed Imp – 2500 sf

Proposed Conditions





# DRAINAGE REVIEW - SIMPLIFIED

- START WITH SIMPLIFIED
- PROPOSED IMPERVIOUS = 2,500 SF
- PROPOSED PERVIOUS = 100 SF
  - GREATER THAN 2,000 SF OF NEW AND/OR REPLACED IMPERVIOUS SURFACE **OR** GREATER THAN 7,000 SF OF LAND DISTURBING ACTIVITY, AND
  - RESULTS IN LESS THAN 5,000 SF OF PGIS, AND
  - RESULTS IN LESS THAN  $\frac{3}{4}$  ACRE OF PGPS AND
  - PROJECT RESULTS IN NO MORE THAN 7,947 SF OF TARGET IMPERVIOUS SURFACE
    - $2,500 \text{ SF} < 7,947 \text{ SF}$
  - PROPOSED PERVIOUS SURFACE AREA IS EQUAL TO OR LESS THAN  $14,941 - 1.88 \times (\text{TARGET IMPERVIOUS SURFACE})$ 
    - $14,941 - 1.88 (2,500) = 10,241 \text{ SF}$
    - $100 \text{ SF} < 10,241 \text{ SF}$
  - NO SENSITIVE AREAS, NO PIPES 12" OR LARGER, NOT A HIGH USE SITE
- **SIMPLIFIED REVIEW**



# EXAMPLE PROJECT – TEAR DOWN / REBUILD

- SIMPLIFIED DRAINAGE REVIEW
  - ENGINEER IS NOT REQUIRED
  - MEET APPENDIX C OF THE KING COUNTY MANUAL AND EVALUATE LID ON ALL NEW AND REPLACED IMPERVIOUS SURFACES

# LID MENU

- 1) FULL DISPERSION
- 2) FULL INFILTRATION
- 3) LIMITED INFILTRATION
- 4) BIORETENTION
- 5) PERMEABLE PAVEMENT
- 6) BASIC DISPERSION

# EXAMPLE PROJECT – TEAR DOWN / REBUILD

- 1) FULL DISPERSION
  - REQUIRES 100 FT NATIVE VEGETATED FLOW PATH
    - DIFFICULT IN KIRKLAND
    - NOT FEASIBLE FOR THIS PROJECT BECAUSE THERE IS NOT EVEN A 100 FT FLOW PATH, LET ALONE NATIVE VEGETATED

# EXAMPLE PROJECT – TEAR DOWN / REBUILD

- 2) FULL INFILTRATION
  - SOILS REPORT REQUIRED AT THIS POINT
    - NEED COARSE SAND / COBBLES OR MEDIUM SAND TO QUALIFY FOR FULL INFILTRATION
    - FOR THIS PROJECT, IF MEDIUM SANDS WERE DISCOVERED, EITHER 75 LF OF INFILTRATION TRENCH (30 FT PER 1,000 SF) OR 225 CF (10 X 6 X 4) FOR A DRYWELL (90 CF PER 1,000 SF) WOULD NEED TO BE PROVIDED

# EXAMPLE PROJECT – TEAR DOWN / REBUILD

- 3) LIMITED INFILTRATION
  - BASED ON INFORMATION FROM SOILS REPORT (ASSUMING NO GROUNDWATER WAS FOUND)
    - INFILTRATION TRENCH WOULD RANGE FROM 52.5 – 130 LF
      - 21 FT PER 1,000 SF FOR FINE SAND / LOAMY SAND
      - 36 LF PER 1,000 SF FOR SANDY LOAM
      - 52 FT PER 1,000 SF FOR LOAM
    - DRYWELL WOULD RANGE FROM 790 – 1820 CF
      - 315 CF PER 1,000 SF FOR FINE SAND / LOAMY SAND
      - 360 CF PER 1,000 SF FOR SANDY LOAM
      - 407 CF PER 1,000 SF FOR LOAM

# EXAMPLE PROJECT – TEAR DOWN / REBUILD

- 4) BIORETENTION
  - BASED ON SOIL INFORMATION
    - NEED A VOLUME OF 125 CF.
      - .05 FT X (IMPERVIOUS AREA DRAINING TO BIORETENTION)
      - .05 FT X 2500 SF = 125 CF

# EXAMPLE PROJECT – TEAR DOWN / REBUILD

- 5) PERMEABLE PAVEMENT
  - BASED ON SOIL INFORMATION
  - ONLY AVAILABLE FOR PATIOS, SIDEWALKS, AND DRIVEWAYS IF SOIL BENEATH CAN HANDLE THE POLLUTION
    - WOULD NOT BE APPLICABLE TO THIS PROJECT SINCE THIS IS ROOF RUNOFF

# EXAMPLE PROJECT – TEAR DOWN / REBUILD

- 6) BASIC DISPERSION
  - BASED ON TOPOGRAPHY
    - THIS SITE WOULD HAVE ENOUGH FOR A 25' VEGETATED FLOW PATH, AND THE TOPOGRAPHY SLOPES AWAY FROM THE HOUSE.
    - GRAVEL TRENCH WOULD BE 36 LF
      - 10 FT PER 700 SF OF IMPERVIOUS AREA



# OTHER INFORMATION

- JULY UPDATE THIS YEAR FOR PRE-APPROVED PLANS
  - CLARIFICATION ON PRIMARILY STORM / LID RELATED POLICIES
- STATE TRAINING ON LID DESIGN AND CONSTRUCTION
  - WEBSITE: [HTTP://WWW.WASTORMWATERCENTER.ORG/LIDSWTRAININGPROGRAM/](http://www.wastormwatercenter.org/lidswtrainingprogram/)

## QUESTIONS?

CONTACT KELLI JONES

[KJONES@KIRKLANDWA.GOV](mailto:KJONES@KIRKLANDWA.GOV)

(425) 587-3855

